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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

ABBOTT, B

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 11/12/99

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

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Office Action Summary

Application No.

09/118,359

Applicant(s)

Keller et al

Examiner

Elizabeth Abbott

Group Art Unit

2823



☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-14, 25-31, and 40 is/are pending in the application.

Of the above, claim(s) 40 is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-14 and 25-31 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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A substitute specification is required as stated in the paper mailed 7/7/99.

35 U.S.C. 102 Rejection

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1, 2, 7, 9 are rejected under 35 U.S.C. 102(a) as being anticipated by Araki et al
U.S. Patent Number 5,882,994 .

Araki discloses a method of forming a floating gate comprising the steps of forming a polysilicon structure (104) over a semiconductive substrate (101), 104 having a first layer (inner portion) and a second layer (outer portion) wherein the first layer has a higher concentration of conductivity enhancing impurity than the second layer; forming a dielectric material (106) over 104; and forming a layer of conductive material (107) over 106 (Col. 3, line 13- Col. 4, line 56 and Figure 8).

35 U.S.C. 103 Rejection

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 5, 6, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to claim 1 and 9 above, and further in view of the following comments.

Araki discloses a dopant concentration of $1 \times 10^{20} \text{cm}^{-3}$ in the first layer and a dopant concentration of none in the second layer (Col. 5, lines 14-17). Araki does not disclose the specifically recited dopant concentration of the instant application, however, the range disclosed by Araki overlaps with the claimed range in the instant application of a concentration equal to or greater than $1 \times 10^{18} \text{cm}^{-3}$ in the first portion and less than $1 \times 10^{18} \text{cm}^{-3}$ in the second portion. (See MPEP 2144.05).

Claims 3, 4, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to claim 1 and 9 above, and further in view of the following comments.

Araki discloses a thickness of the first layer (inner portion) of silicon to be 70 nm and a thickness of 70 nm for the second layer (outer portion) of silicon (Col. 3, lines 30-32). Araki does not disclose the specifically recited thickness ranges of the instant application, however, the disclosed range overlaps with the claimed range in the instant application of a thickness for the inner portion to comprise at least 25%, between 25% and 75%, and less than 75% of the floating gate thickness. (See MPEP 2144.05).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to Claim 9 above, and further in view of the following comments.

Araki discloses a dopant concentration of $1 \times 10^{20} \text{cm}^{-3}$ in the first layer of polysilicon (Col. 5, lines 14-17). This range overlaps with the claimed range in the instant application of greater

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than or equal to $1 \times 10^{18} \text{ cm}^{-3}$ for the first layer. Araki also discloses a thickness of the first layer (inner portion) of silicon to be 70 nm and a thickness of 70 nm for the second layer (outer portion) of silicon (Col. 3, lines 30-32). This range overlaps with the claimed range in the instant application of a thickness for the inner portion to occupy less than 75% of the floating gate thickness. (See MPEP 2144.05).

Claims 8 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Araki. The reference is applied as applied to claims 1, 5, and 6 above.

Araki discloses that 106 is an ONO layer formed by oxidizing the substrate to form a first oxide layer over the second layer of polysilicon, forming a nitride layer over the first oxide layer, and oxidizing the substrate to form a second oxide layer over the layer of nitride. Araki also discloses that 107, 106, and 104 are etched to form the floating gate (Col. 4, lines 44-63 and Figure 8). Araki does not disclose doping of the first polysilicon layer after forming the layer but instead deposits a doped layer. The examiner takes judicial notice that post deposition doping to form doped layers was known at the time of the applicant's invention to be a suitable method of forming doped layers. It would have been obvious to one with ordinary skill in the art at the time of the invention to employ the known method for its disclosed intended purpose to achieve the doped layer formation step of Araki.

Claims 26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to claim 25 above, and in view of the following.

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Araki discloses first and second thicknesses of the first and second polysilicon layers to be 70 nm and 70 nm respectively. Araki does not disclose the specifically recited thicknesses of the instant application, however, the range disclosed by Araki overlaps with the claimed range in the instant application in being substantially the same and that the first thickness constitutes less than or equal to 75% of the aggregate thickness of the two layers (Col. 3, lines 30-32). (See MPEP 2144.05).

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to claim 25 above, and in view of the following. Araki discloses first and second thicknesses of the polysilicon layers (Col. 3, lines 30-32). Araki fails to teach the first and second thicknesses being different. However, given the substantial teaching of Araki, it would have been obvious to one with ordinary skill in the art at the time of the invention to determine the optimal thicknesses for the first and second layers through routine experimentation and optimization to achieve optimum benefits (See MPEP 2144.05).

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to Claim 25 above, and further in view of the following comments.

The method of claim 31 merely describes the effect of doping the first layer with a higher concentration of impurity than the second layer. Araki discloses forming a second layer of polysilicon to have a lower dopant concentration than the first layer. Araki does not explicitly disclose that this process of doping results in a greater sheet resistance in the second layer than in the first layer. Wolf teaches that undoped polysilicon exhibit high sheet-resistivity values while

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doped polysilicon exhibits a lower the resistivity (Silicon Processing Vol. 2 pages 581) .

Therefor, doping the second layer of polysilicon with a lower concentration of impurity than the first as disclosed by Araki would inherently result in a the second layer possessing a higher sheet resistance.

Claims 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Araki as applied to Claim 25 above and further in view of the following comments.

Araki discloses a first polysilicon layer 70 nm thick and a second layer of polysilicon 70 nm thick. Araki does not disclose the specifically recited thicknesses of between 450 Angstroms and 550 Angstroms. However, given the substantial teaching of Araki, it would have been obvious to one with ordinary skill in the art at the time of the invention to determine the optimal thicknesses for the first and second layers through routine experimentation and optimization to achieve optimum benefits (See MPEP 2144.05).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Closing

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956. **See MPEP 203.08.**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Elizabeth Abbott whose telephone number is (703) 306-5866. The examiner can normally be reached on Monday through Friday.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax number for this group is (703)308-

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax number for this group is (703)308-7722(and 7724 and 7382). MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.


George Fourson
Primary Examiner
Art Unit 2823



E. Abbott
November 4, 1999